



Traffic Flow For Traveler Information Systems

Oct, 2008

- Traffic congestion costs \$70B a year
 - Road construction can't keep up with demand
 - Congestion spreading to smaller cities
 - Many DOT data systems focus on operations not traveler information
 - Improvements compete for investment and operating funds
- Real-time flow data solutions can:
 - Improve existing infrastructure utilization
 - Improve financial efficiency and flexibility
 - Provide more comprehensive coverage at less cost
 - Enhance data quality and reliability
 - Enable actionable, real-time decision-making
 - Improve planning, modeling and reporting
- High-quality, real-time traffic data changes the game
 - Drivers make better choices saving time, money, gasoline, pollution
 - Traffic congestion load is spread over time and space
 - Public increases awareness of Transportation agency benefits



- **Sensor**
 - Solar powered
 - Wireless communications
 - Fast installation
 - Lightweight, reliable, and accurate
 - Low cost
 - >800 installed to date
- **Server Farm**
 - Manages sensor network
 - Validates and formats data
 - Integrates public data sources
- **Data Client**
 - Streams XML feed to customers

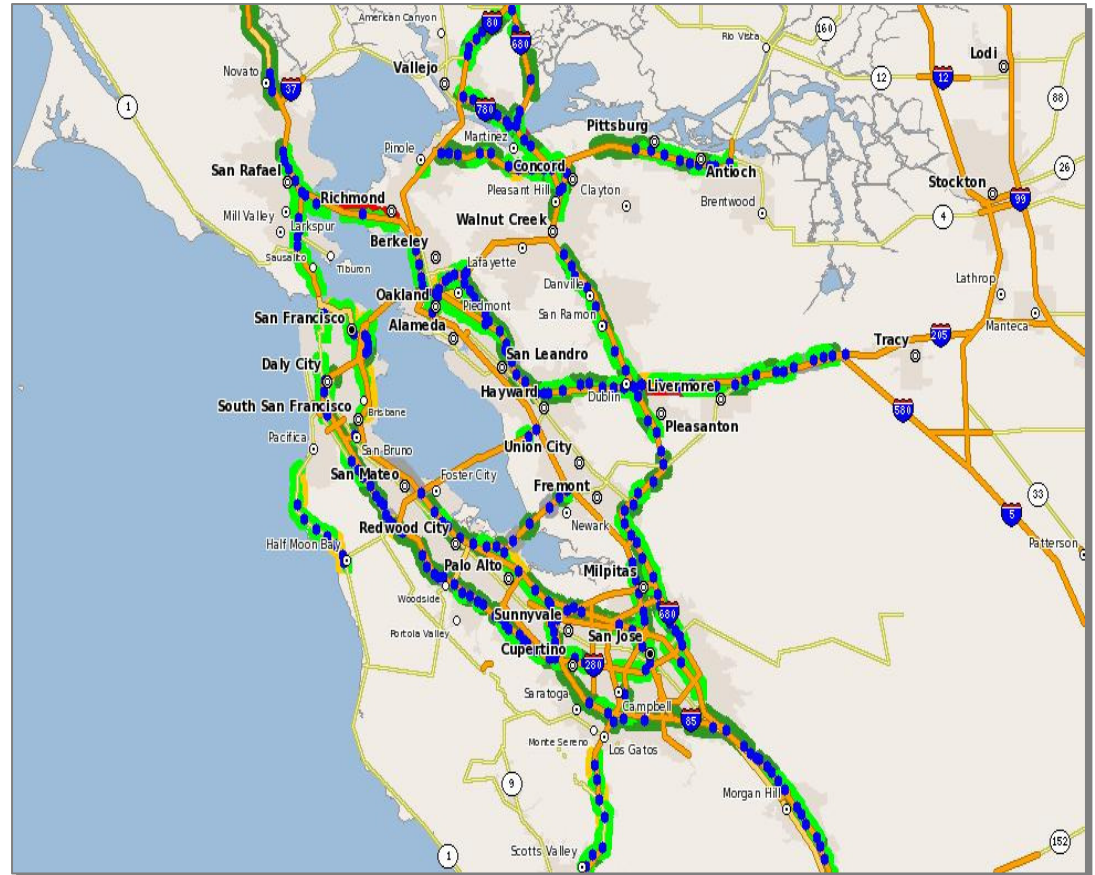
SPEEDINFO'S DVSS-100 SENSOR SPECIFICATIONS



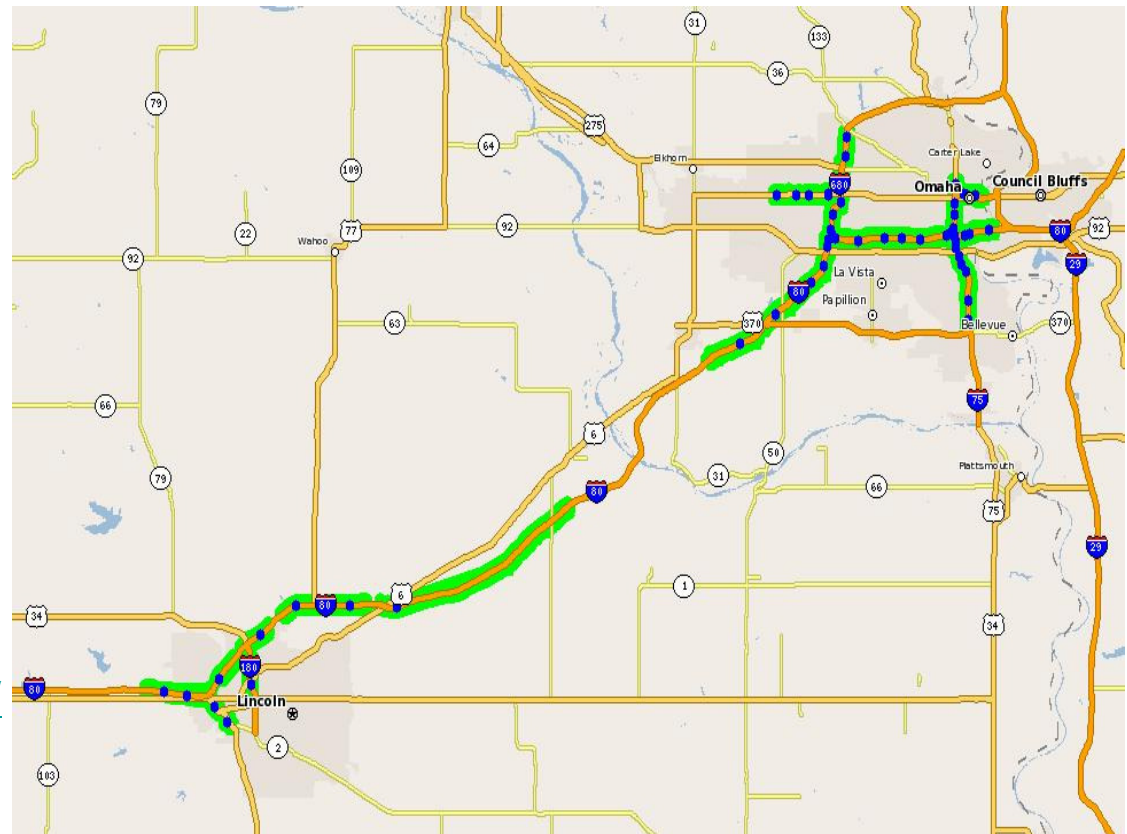
- **Sensor**
 - License free – 24.125GHz
 - Range 1800 ft, bi-directional
 - Single device measures both sides of roadway
 - Accuracy: 0.1mph, avg. +/- 3mph
 - Installs on existing infrastructure
 - Install time 15-20 minutes
 - Solar: 5W or 10W
 - Sealed lead acid batteries
 - 21 days of operation without photons
 - Weight: 16 lbs
 - Small profile, negligible wind loading
 - Programmable sampling rates
 - Default 2 measurements/minute
 - Adaptive reporting rates
 - Data Backhaul – ATT Wireless GPRS
 - Full Duplex
 - External Power and Communication port

SAN FRANCISCO BAY AREA – UNIQUE HYBRID APPROACH

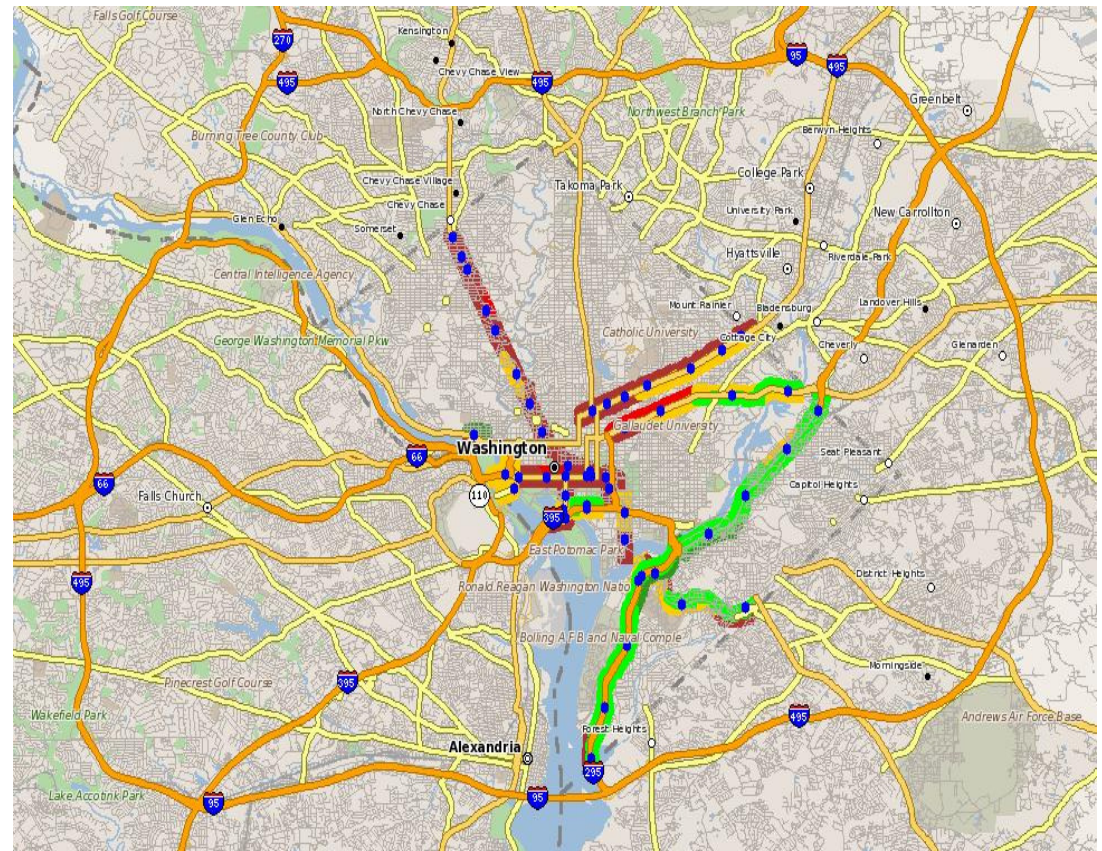
- **Highway loops**
 - 1200 sensors
 - 15 years
 - >\$120m investment
 - Half are out of service
 - 30% coverage
- **Toll Tags**
 - 780,000 toll tags
 - 5 years
 - >\$18m investment
 - 10% coverage
- **SpeedInfo Sensors**
 - 324 sensors
 - 45 days
 - <\$400K investment
 - 60% coverage
 - Primary 511 data source



- NDOR contract
- 70 sensor network to supplement and feed 511 system, TMC
- >200 miles coverage at 1 mile separation on I-80 metro corridors and Hwy 6
- Data used for analysis and to provide flow, travel times and construction zone coverage for bypass roads
- <http://map.speedinfo.com/usa/nebraska/index.php>



- dDOT Contract
- 50 sensor network to instrument all major arterial evacuation routes
- System data to be used to evaluate emergency signal timing patterns and transportation communication protocols and flow model
- SpeedInfo XML feed integrated into data center



- Travel Times
 - Install sensors every mile or less
 - Utilize data for CMS/DMS presentation of times
 - Utilize data for TMC Operations, Highway/State Patrol, Accident Response
 - Utilize data for 511 Traveler Information System
- Construction Zone Safety or By-Pass Road Congestion Mgmt
- Incident Detection
 - Real-time alerts to speed changes
 - Automatically drive video camera response
 - Alert responders and media
- Congestion Management (Operations)
 - Dynamic Ramp Metering
 - Congestion level pricing
 - HOV/HOT lane monitoring
 - Performance Metrics: congestion index and length, annual delay, cost of congestion, system bottlenecks, etc
- Emerging mobile platforms

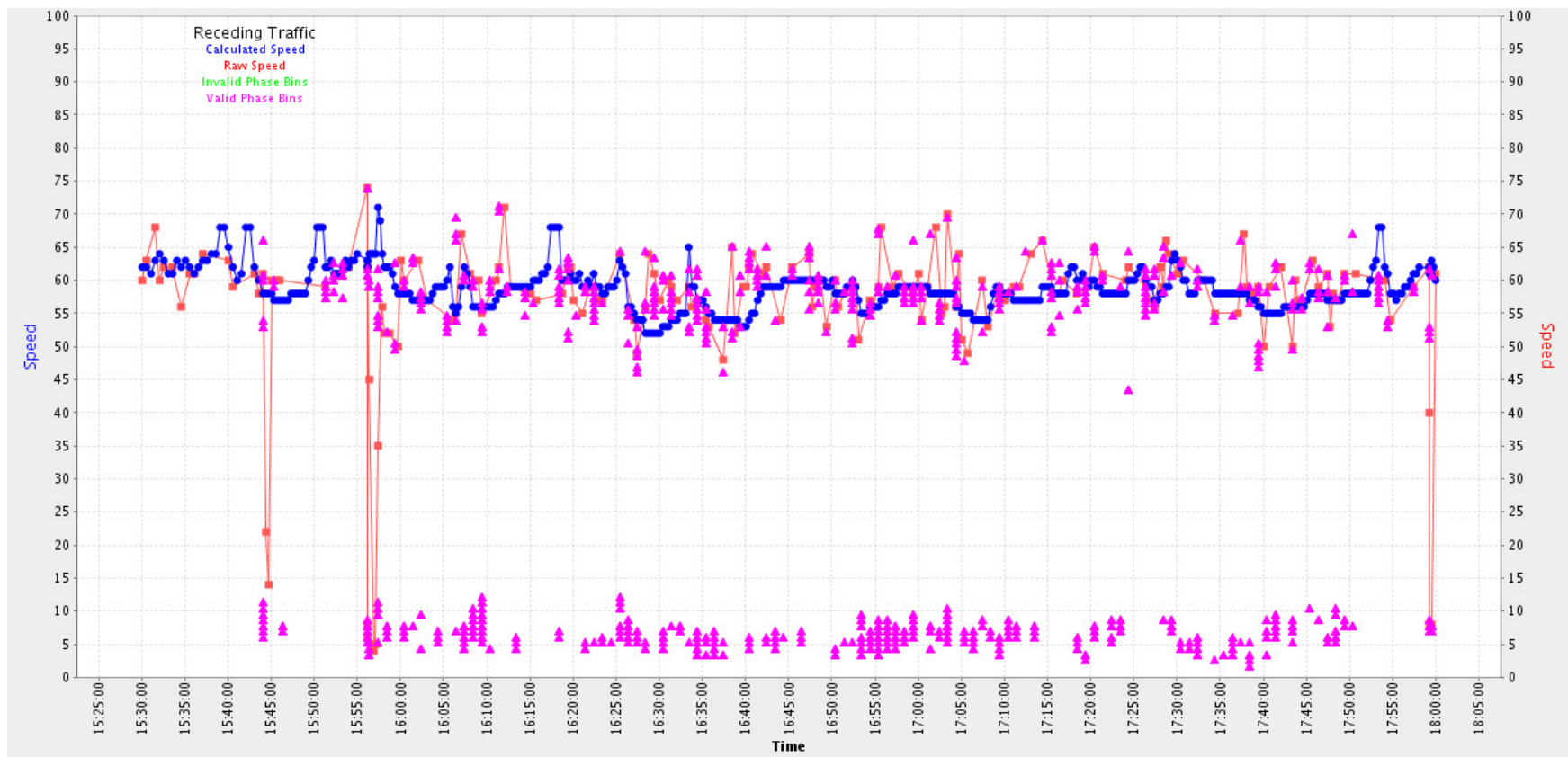
I-80 at Ashby Ave East 3/17/06 (Friday)

AshbyEast Speeds 2 Days Ago
(in MPH)



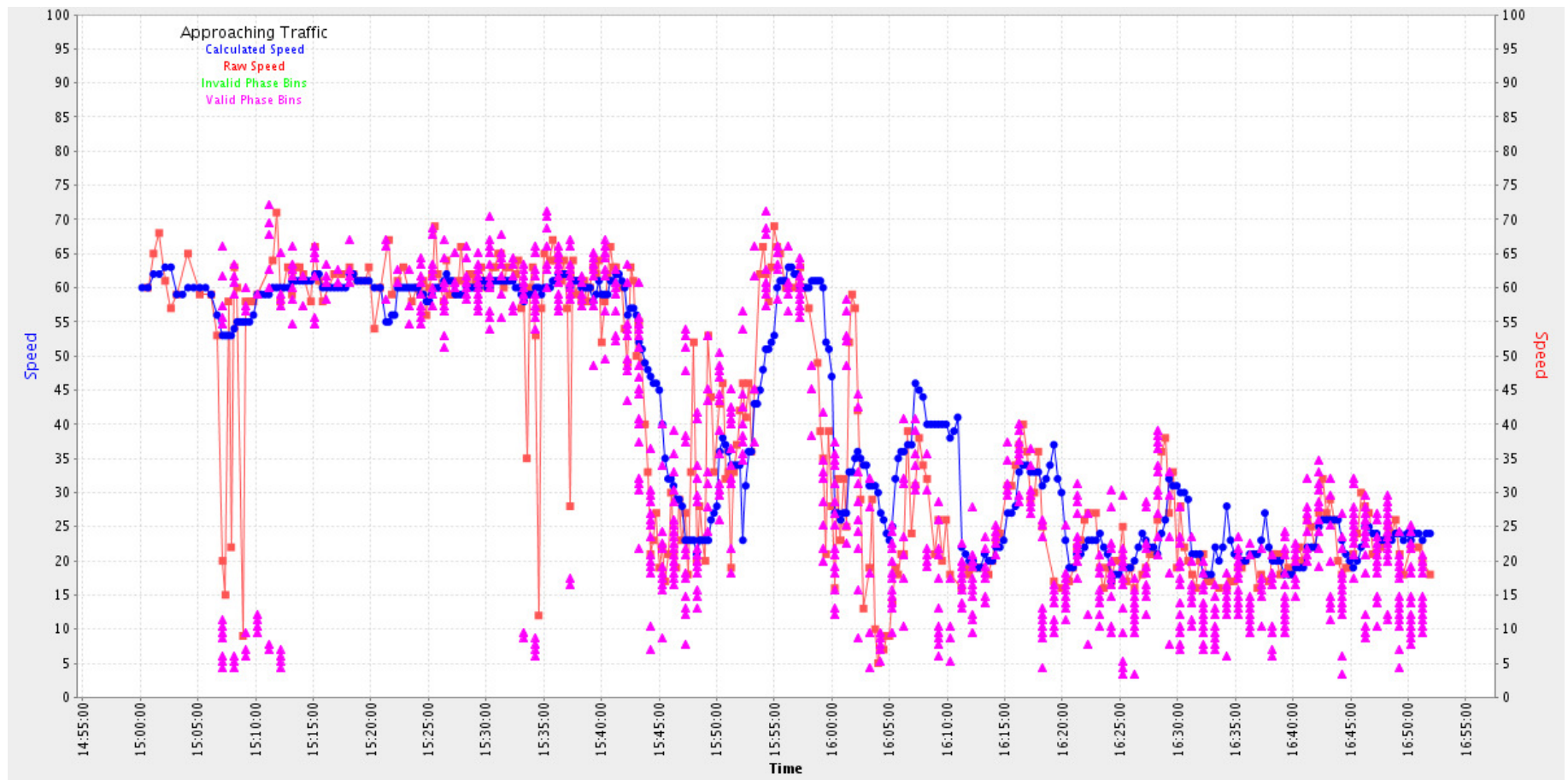
Source: SpeedInfo

I-80 W @ MM 412.4 (DMS) 4/30/08

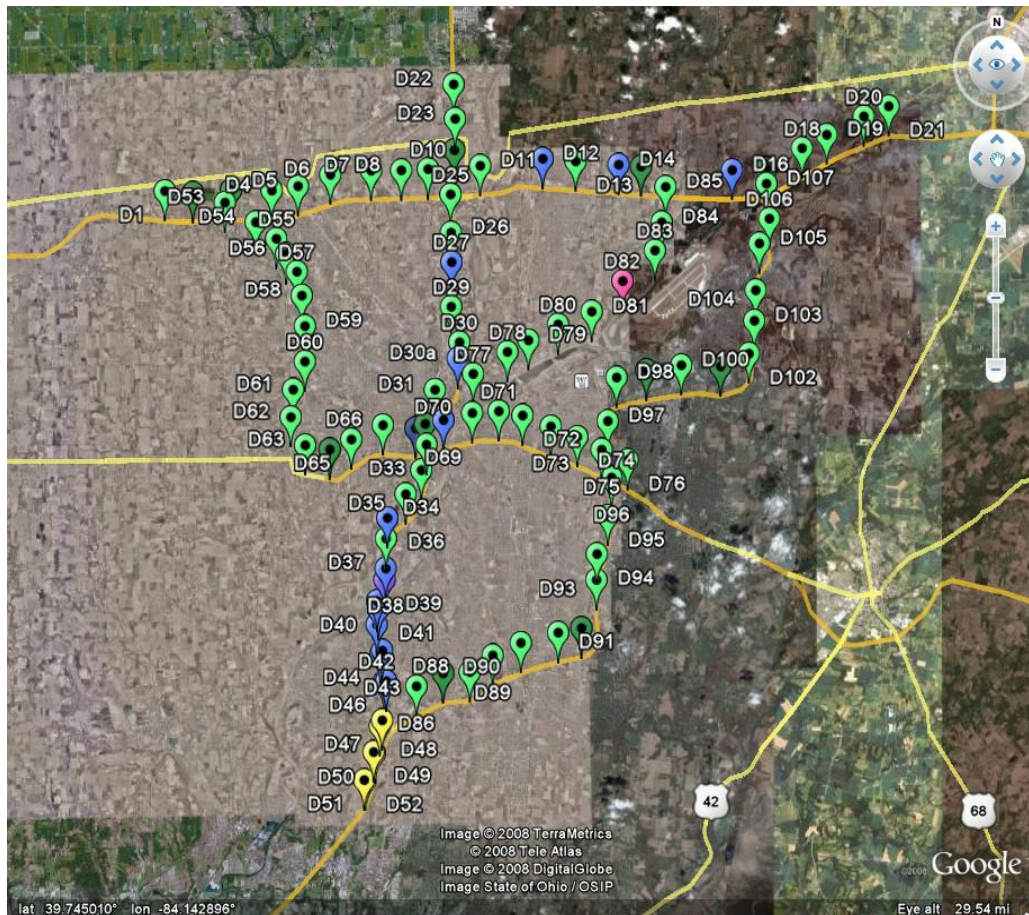


Source: SpeedInfo

I-5 at Tacoma, WA 4/18/08 (Friday)



Source: SpeedInfo



- Installed -Aug 2008
- 110 sensors
- Install time – 2 weeks
- ODOT Traffic Engineering
- SpeedInfo supplies Speed and Travel Times
- Data Supports –
 - Buckeye Traffic 511
 - DMS/CMS
 - HAR FM

	ERROR	DATA TABLE				
	TOTAL - OVERALL					
	MM 55	MM 55.8	MM 57.6	North	South	Total
	8.13%	8.50%	10.10%	9.04%	8.72%	8.91%
By Direction	TOTAL - NORTH					
	MM 55	MM 55.8	MM 57.6	Total		
	7.79%	8.63%	10.69%	9.04%		
	TOTAL - SOUTH					
	MM 55	MM 55.8	MM 57.6	Total		
	8.47%	8.37%	9.52%	8.78%		
By Date	7/17/2007					
	MM 55	MM 55.8	MM 57.6	North	South	Total
	6.68%	8.60%	8.73%	8.74%	7.27%	8.00%
	7/19/2007					
	MM 55	MM 55.8	MM 57.6	North	South	Total
	9.81%	9.35%	10.76%	9.25%	11.20%	10.07%
	8/15/2007					
	MM 55	MM 55.8	MM 57.6	North	South	Total
	8.70%	8.76%	10.62%	10.18%	8.44%	9.34%
	8/24/2007					
	MM 55	MM 55.8	MM 57.6	North	South	Total
	7.01%	7.05%	10.25%	8.93%	7.20%	8.09%

Error Sources – First Pass

- Stop and Go Traffic
- Cosine Error
- Sensor Placement
- Statistical Variation
- Laptop clock error
- Driver variables

Expected results – Next Pass

- Algorithm improvements for stop and go traffic
- Improve GPS probe accuracy using direct real-time GPS speed
- Expected error – < 5%

* source: Ohio DOT

Dayton Travel Time Verification						
Date	Time	Road	Direction	Segment	Actual Travel Time by Floating Car Method	Speed Info Travel Time
9/12/2008	9:16 AM	I-70	W	SR4 (South) to SR 4 (Enon)	5.9	6
9/12/2008	9:16 AM	I-70	W	SR 49 to I-75	8	8
9/12/2008	9:16 AM	I-70	W	I-75 to SR 4 (Enon)	12.8	13
9/12/2008	10:38 AM	I-675	S	I-75 to US-35	12.1	12
9/12/2008	10:38 AM	I-675	S	US-35 to I-70	12.3	13
9/12/2008	12:44 PM	I-75	S	I-70 to County Line (Miami)	3.7	3
9/12/2008	12:44 PM	I-75	S	County Line (Warren) to I-675	2.3	NOT-AVAILABLE
9/12/2008	12:44 PM	I-75	S	County Line (Warren) to US-35	11.5	13
9/12/2008	12:44 PM	I-75	S	US-35 to I-70	9.5	10
9/12/2008	12:44 PM	I-75	S	US-35 to SR-4	2.1	2
9/12/2008	12:44 PM	I-75	S	I-675 to US-35	9.1	10
9/12/2008	12:44 PM	I-75	S	US-35 to County Line (Miami)	13.1	14
9/12/2008	11:10 AM	I-75	N	I-70 to County Line (Miami)	3.6	3
9/12/2008	11:10 AM	I-70	N	County Line (Warren) to I-675	2.5	NOT-AVAILABLE
9/12/2008	11:10 AM	I-70	N	County Line (Warren) to US-35	10.8	13
9/12/2008	11:10 AM	I-70	N	US-35 to I-70	8.8	9
9/12/2008	11:10 AM	I-70	N	US-35 to SR-4	2.3	2
9/12/2008	11:10 AM	I-75	N	I-675 to US-35	8.4	9
9/12/2008	11:10 AM	I-70	N	US-35 to County Line (Miami)	12.4	11

Results – 2nd Pass

- Java client algorithm improvements for stop and go traffic and milepost information
- Without “no car” individual sensor adjustments
- Testing continues to include more rain and stop and go traffic
- Error – < 5%

* source: Ohio DOT

SpeedInfo technology application supports a unique business model

- Public-Private partnership based on DOTs funding/financial model
- Equipment Purchase or Data Service with/without data sharing
 - Capital purchase, service contract, lease, rent, private industry pay or free
- Turn-key Data Service includes:
 - Service Level Agreements with availability guarantee and penalty
 - All installation, communication and maintenance costs
 - Low monthly payment or pre-pay
- Data sharing provides for private sector offsetting DOT costs
 - Use data rights to limit costs or not

	<u>Private</u>	<u>Partnership</u>	<u>Public</u>
Funding	100% Industry	50% / 50% Split	100% Government
Commercial Data	Radio / TV Web Subscribers	Web Subscribers	
Public Data Use	Operations Emergency 511 Phone	Add: 511 Web CMS	Unrestricted
Public Savings	100%	95%	90%

- Leverage network infrastructure and design to manage additional detection technologies:
 - Car counting and classification
 - Camera to capture pictures on demand
 - Road surface temperature sensor
 - Micro-climate weather conditions
- Designed to support optional communication platforms
- Data Warehousing and Analysis



THANK YOU

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Oct, 2008